

Name: \_\_\_\_\_

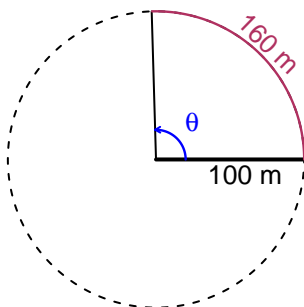
Date: \_\_\_\_\_

## Trig Final (Solution v45)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 100 meters. The arc length is 160 meters. What is the angle measure in radians?

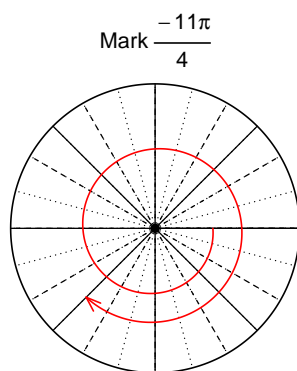


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$\theta = 1.6$  radians.

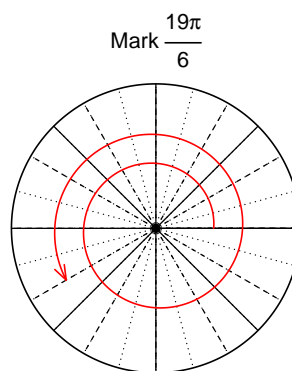
### Question 2

Consider angles  $-\frac{11\pi}{4}$  and  $\frac{19\pi}{6}$ . For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for  $\cos\left(-\frac{11\pi}{4}\right)$  and  $\sin\left(\frac{19\pi}{6}\right)$  by using a unit circle (provided separately).



Find  $\cos(-11\pi/4)$

$$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$$



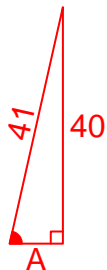
Find  $\sin(19\pi/6)$

$$\sin(19\pi/6) = \frac{-1}{2}$$

### Question 3

If  $\sin(\theta) = \frac{-40}{41}$ , and  $\theta$  is in quadrant III, determine an exact value for  $\tan(\theta)$ .

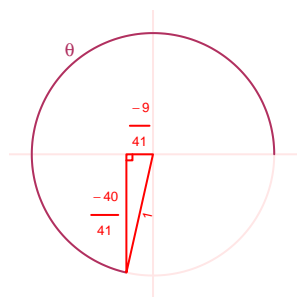
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}A^2 + 40^2 &= 41^2 \\A &= \sqrt{41^2 - 40^2} \\A &= 9\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-40}{41}}{\frac{-9}{41}} = \frac{40}{9}$$

### Question 4

A mass-spring system oscillates vertically with a midline at  $y = 5.42$  meters, a frequency of 3.13 Hz, and an amplitude of 8.7 meters. At  $t = 0$ , the mass is at the midline and moving up. Write an equation to model the height ( $y$  in meters) as a function of time ( $t$  in seconds).

Any of these equations would get full credit.

$$y = 8.7 \sin(2\pi 3.13t) + 5.42$$

or

$$y = 8.7 \sin(6.26\pi t) + 5.42$$

or

$$y = 8.7 \sin(19.67t) + 5.42$$